

Application No. 10/598,480  
Amendment dated October 12, 2010  
Reply to Final Office Action dated August 12, 2010

10/15/2010 /A.Z./

## AMENDMENTS TO THE CLAIMS

*The listing of claims will replace all prior versions and listings of claims in the application:*

### Listing of Claims:

1. (Currently Amended) A method of producing magnetic oxide nanoparticles without using an oxidizing or a reducing agent or metal oxide nanoparticles, comprising:

(1) adding a magnetic or metal precursor to a surfactant or a solvent containing the surfactant to produce a mixed solution;

(2) heating the mixed solution to 50-600°C to decompose the magnetic or metal precursor by heating so as to form the magnetic oxide nanoparticles or metal oxide nanoparticles; and

(3) separating the magnetic oxide nanoparticles or metal oxide nanoparticles, wherein the surfactant is a mixture of organic acid and organic amine, where said organic acid is C<sub>n</sub>COOH, and said organic amine is C<sub>n</sub>NH<sub>2</sub>, wherein C<sub>n</sub> is hydrocarbon, and 7≤n≤30.

2. (Currently Amended) The method as set forth in claim 1, wherein the magnetic precursor is selected from the group consisting of a metal nitrate-based compound, a metal sulfate-based compound, a metal fluoroacetoacetate-based compound, a metal halide-based compound, a metal perchlorate-based compound, a metal sulfamate-based compound, a metal stearate-based compound, and an organometallic compound,

wherein a metal halide-based compound is MX<sub>a</sub>, where M is Ti, Zr, Ta, Nb, Mn, Sr, Ba, W, Mo, Sn, or Pb; X is F, Cl, Br, or I; and [[0<a<5]] 0<a≤5.

3. (Original) The method as set forth in claim 2, wherein the metal nitrate-based compound is selected from the group consisting of iron(II) nitrate, iron(III) nitrate, manganese nitrate, cobalt nitrate, zinc nitrate, nickel nitrate, and copper nitrate.

4. (Withdrawn) The method as set forth in claim 2, wherein the metal sulfate-based compound is selected from the group consisting of iron sulfate (II), iron sulfate (III), manganese sulfate, cobalt sulfate, nickel sulfate, copper sulfate, and zinc sulfate.

5. (Withdrawn) The method as set forth in claim 2, wherein the metal fluoroacetoacetate-based compound is selected from the group consisting of iron trifluoroacetoacetate, cobalt hexafluoroacetoacetate, manganese hexafluoroacetoacetate, nickel hexafluoroacetoacetate, copper hexafluoroacetoacetate, and zinc hexafluoroacetoacetate.

6. (Withdrawn) The method as set forth in claim 2, wherein the metal halide-based compound is selected from the group consisting of iron(II) chloride, iron(III) chloride, cobalt chloride, nickel chloride, copper chloride, zinc chloride, gadolinium chloride, iron(II) bromide, iron(III) bromide, cobalt bromide, nickel bromide, copper bromide, zinc bromide, iron(II) iodide, iron(III) iodide, manganese iodide, nickel iodide, copper iodide, zinc iodide, and cobalt iodide.

7. (Withdrawn) The method as set forth in claim 2, wherein the metal perchlorate-based compound is selected from the group consisting of iron(III) perchlorate, cobalt

perchlorate, manganese perchlorate, nickel perchlorate, copper perchlorate, and zinc perchlorate.

**8.** (Withdrawn) The method as set forth in claim 2, wherein the metal sulfamate-based compound is selected from the group consisting of iron sulfamate, manganese sulfamate, nickel sulfamate, cobalt sulfamate, copper sulfamate, and zinc sulfamate.

**9.** (Withdrawn) The method as set forth in claim 2, wherein the metal stearate-based compound is selected from the group consisting of iron stearate, manganese stearate, nickel stearate, copper stearate, cobalt stearate, and zinc stearate.

**10.** (Withdrawn) The method as set forth in claim 2, wherein the organometallic compound is selected from the group consisting of iron(III) meso tetr phenylporphin oxo dimer, tris(2,2,6,6, tetramethyl-3,5-heptanedionate)iron(III), bis(2,2,6,6-tetramethyl-3,5-heptanedionate)nickel, bis(2,2,6,6-tetramethyl-3,5-heptanedionate)cobalt, bis(2,2,6,6-tetramethyl-3,5-heptanedionate)copper, bis(2,2,6,6-tetramethyl-3,5-heptanedionate)zinc, and bis(2,2,6,6-tetramethyl-3,5-heptanedionate)manganese.

**11.** (Withdrawn and Currently Amended) The method as set forth in claim 1, wherein the metal precursor is a metal halide-based compound, wherein a metal halide-based compound is MX<sub>a</sub>, where M is Ti, Zr, Ta, Nb, Mn, Sr, Ba, W, Mo, Sn, or Pb; X is F, Cl, Br, or I; and [[0<a<5]] 0<a≤5.

**12.** (Withdrawn) The method as set forth in claim 11, wherein the metal halide-based compound is selected from the group consisting of titanium tetrachloride, zirconium tetrachloride, tantalum pentachloride, tin tetrachloride, tungsten chloride, molybdenum tetrachloride, manganese chloride, titanium tetrabromide, zirconium, tetrabromide, tantalum pentabromide, tin tetrabromide, and manganese bromide.

**13.** (Cancelled)

**14.** (Withdrawn and Previously Amended) The method as set forth in claim 1, wherein the organic acid is selected from the group consisting of oleic acid, lauric acid, stearic acid, mysteric acid, and hexadecanoic acid.

**15.** (Withdrawn and Previously Amended) The method as set forth in claim 1, wherein the organic amine is selected from the group consisting of oleyl amine, lauryl amine, and hexadecyl amine.

**16.-17.** (Cancelled)

**18.** (Previously Amended) The method as set forth in claim 1, wherein the solvent is selected from the group consisting of an ether-based compound; hydrocarbon ; a mixture of organic acid and organic amine; and alkane thiol

wherein an ether-based compound is  $C_{n_2}O$ , where  $C_n$  is hydrocarbon, and  $5 \leq n \leq 30$ ; hydrocarbon is  $C_n$ , and  $7 \leq n \leq 30$ ; organic acid is  $C_nCOOH$ , where  $C_n$  is hydrocarbon, and

$7 \leq n \leq 30$ ; organic amine is  $C_nNH_2$ , where  $C_n$  is hydrocarbon, and  $7 \leq n \leq 30$ ; and alkane thiol is  $C_nSH$ , where  $C_n$  is hydrocarbon, and  $7 \leq n \leq 30$ .

**19.** (Original) The method as set forth in claim 18, wherein the ether-based compound is selected from the group consisting of octyl ether, benzyl ether, and phenyl ether.

**20.** (Withdrawn) The method as set forth in claim 18, wherein the hydrocarbon is selected from the group consisting of hexadecane, heptadecane, and octadecane.

**21.** (Withdrawn) The method as set forth in claim 18, wherein the organic acid is selected from the group consisting of oleic acid, lauric acid, stearic acid, myristic acid, and hexadecanoic acid.

**22.** (Withdrawn and Previously Amended) The method as set forth in claim 18, wherein the organic amine is selected from the group consisting of oleyl amine, and hexadecyl amine.

**23.** (Withdrawn) The method as set forth in claim 18, wherein the alkane thiol is selected from the group consisting of dodecane thiol hexadecane thiol, and heptadecane thiol.

**24.** (Original) The method as set forth in claim 1, wherein the surfactant is contained in the mixed solution in an amount that is 1-100 times the amount of the magnetic or metal precursor.

**25.** (Original) The method as set forth in claim 1, wherein the solvent is contained in the mixed solution in an amount that is 1-100 times the amount of the magnetic or metal precursor.

**26.** (Original) The method as set forth in claim 1, wherein the mixed solution containing the magnetic precursor is heated at 50-600°C for 30 min-3 hours.

**27.** (Original) The method as set forth in claim 1, wherein the mixed solution containing the metal precursor is heated at 50-600°C for 1 min-2 hours.

**28.** (Original) The method as set forth in claim 1, wherein sizes of the magnetic oxide nanoparticles are controlled by adjusting a concentration of the magnetic precursor.

**29.** (Previously Amended) The method as set forth in claim 1, wherein diameters of the metal oxide nanoparticles are controlled by adjusting a composition ratio of surfactants when two types of surfactant are used.

**30.** (Original) The method as set forth in claim 1, wherein the magnetic oxide nanoparticles include single component magnetic oxide nanoparticles or composite magnetic oxide nanoparticles.

**31.** (Currently Amended) The method as set forth in claim 30, wherein the single component magnetic oxide nanoparticles include  $M_xO_y$ , wherein M is Fe, Ni, Co, Gd, Mn, Zn, Cr, or Cu; [[0<x<3; and 0<y<4]] 0<x≤3; and 0<y≤4.

**32.** (Withdrawn and Previously Amended) The method as set forth in claim 30, wherein the composite magnetic oxide nanoparticles include  $MM'_2O_4$ , wherein M and M' are independently Fe, Co, Ni, Mn, Zn, Gd, or Cr.

**33.** (Original) The method as set forth in claim 1, wherein the metal oxide nanoparticles include single component metal oxide nanoparticles or composite metal oxide nanoparticles.

**34.** (Currently Amended) The method as set forth in claim 33, wherein the single component metal oxide nanoparticles include  $M_xO_y$ , wherein M is Ti, Zr, Ta, Nb, Mn, Sr, Ba, W, Mo, Sn, or Pb; [[0<x<3; and 0<y<5]] 0<x≤3; and 0<y≤5.

**35.** (Withdrawn and Currently Amended) The method as set forth in claim 33, wherein the composite metal oxide nanoparticles include  $BaTiO_3$ ,  $PbTiO_3$ ,  $ZrTiO_3$ ,  $BaSr_xTi_{1-x}O_3$ , or  $PbZr_xTi_{1-x}O_3$ , wherein x is [[0<x<1]] 0<x≤1.